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(54) Device for taking up and covering containers arranged in a line and filled with liquid to be analyzed.

(57) A device (1) is disclosed comprising linearly arranged receptacles (10) to receive containers (2) filled with liquid to be analyzed and cover means (6) for the openings (20) of the containers.

Each receptacle (10) includes a lid (60) which is movably arranged on a retainer (70) and associated with an opening (20) of a container (2). Lid (60) can be pivoted about a horizontally extending axis of rotation (63) of retainer (70) from a covering position 61 to an uncovering position 62. Pivoting of lid (60) is effected by means of an arm (71) arranged on retainer (70) which arm is manually actuated if the device (1) is outside the analyzer and actuated by means of an actuating element (30) of an actuating means (3) if the device (1) is arranged within the

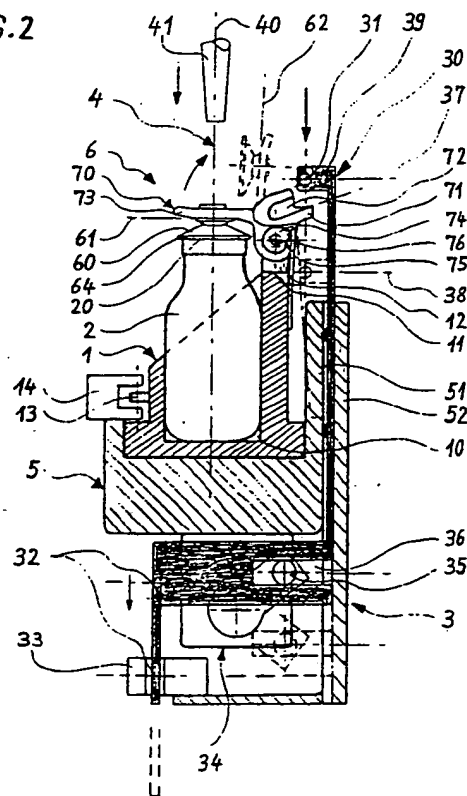
processing station (4) of the analyzer.

Retainer (70) includes a cam (74) which is concentrically arranged to the axis of rotation (63) and which is engaged by a hold-down means (75) by means of which lid (60) is retained in its covering position (61). Each receptacle (10) is associated with a sensing mark (13) which by means of a sensor (14) arranged in the area of the actuating means (3) permits the device (1) or the container (2) to be aligned with the aspirating head (41) of a processing station (4) for removal of liquid to be analyzed.

Lid (60) consisting of resilient plastic material is designed as a sealing means (64) on its bottom side to prevent the liquid to be analyzed from being evaporated, contaminated or spilled.

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FIG. 2



The invention relates to a device comprising linearly arranged receptacles to receive containers filled with liquid to be analyzed and a cover means equipped with sealing means for covering the openings of the containers.

Various devices are known for retaining and moving containers filled with liquid to be analyzed which include a cover.

A retaining means for test tubes is known from DE-GM 18 23 845 having a single lid which covers all test tubes and is provided with a sealing means.

It is the object of the invention to provide a device of the generic type which permits easy insertion and removal of individual containers and enables failsafe operation in an automatic analyzer, in particular the automatic removal of liquids to be analyzed from the containers arranged in a processing station by means of an aspirating head. Also, evaporation, contamination or spilling of the liquids is to be reliably prevented. Moreover, a quick and reliable diagnosis is to be guaranteed at a high processing rate.

According to the invention, the above object is attained in that

- each take-up means includes a lid associated with an opening of a container, and in that
- the lid can be pivoted from a covering position to an uncovering position.

The invention provides for the lid to be movably arranged on a retainer and for the retainer to be pivotable about a horizontally extending axis. The retainer includes an arm which can be manually actuated if the device is arranged outside the analyzer and which is actuated by an actuating element of an actuating means if the device is arranged within the processing station of the analyzer.

Furthermore, the retainer advantageously comprises a cam which is mounted concentrically to the axis and which is engaged by a hold-down element by means of which the lid is retained in its covering position.

Expediently, each receptacle is associated with a sensing element and a sensor is arranged in the area of the actuating means.

Advantageously, the lid consists of an elastic plastic material and is designed as a sealing means on its bottom surface.

Further features and advantages can be inferred from the description of an embodiment of the invention shown in the drawing and from the subclaims.

In the drawing

Fig. 1 shows a top view of the device according to the invention installed in the processing station of an analyzer

Fig. 2 shows a lateral view of the device according to Fig. 1 (cross-section

along a line A-A in Fig. 1).

The device 1 shown in Fig. 1 is arranged on a transport path 5 in the area of a processing station 4 of an analyzer.

Device 1 consists of a plurality of linearly arranged receptacles 10 to receive containers 2 filled with liquid to be analyzed.

Each receptacle 10 comprises a cover means 6 illustrated in its covering position and designed as a lid 60 arranged on an outrigger 73 of a retainer 70 and associated with the opening 20 of a container 2, said lid being pivotable about an axis of rotation 63 of a pin 12 extended along a longitudinal side of the device and supported in bearings 11 of a retainer.

On a longitudinal side of device 1 extending opposite to the bearings 11 each receptacle 10 is associated with a sensing mark 13 designed as a slot and arranged in a horizontally extending bar 15.

One of the receptacles 10 is aligned with an actuating means 3 arranged in processing station 4 and with an aspirating station 40 for liquids to be analyzed in which a sensor 14 designed as an optoelectric switch is arranged for detecting the sensing mark 13.

The actuating means 3 comprises an actuating element 30 including an actuating pin 31 projecting into the area of an arm 71 of retainer 70.

On one of its sides, retainer 70 includes a cam 74 which is concentrically arranged to the axis of rotation 63 and which is engaged by a hold-down element 75.

In Fig. 2, the lid 60 is shown both in its covering position 61 and in its uncovering position 62. Above the lid an aspirating head 41 for liquids to be analyzed is illustrated which is aligned with the center axis of container 2.

Beneath transport path 5 a microprocessor controlled, motordriven eccentric drive 34 of actuating means 3 is arranged with its drive pin 35 engaging with a horizontally protruding bifurcated lever arm 36 of actuating element 30.

Actuating element 30 which is designed as a flat slider is guided in a vertically extending channel 51 of a side wall 52 of transport path 5. In the area of the lower end of the actuating element 30 two sensing apertures 32 are arranged one above the other to cooperate with a sensor 33, said apertures being associated with the covering position 61 and the uncovering position 62 of the lid 60 or with the upper end position 37 and the lower end position 38 of the actuating element.

In its upper end position 37, an actuating pin 31 of actuating element 30 mounted to a retaining arm 39 is positioned above and outside a bifurcated guide means 72 of arm 71 of retainer 70, in which case the lid lies planarly on the opening 20

of a container 2 with the hold-down element 75 formed as a leaf spring engaging the extreme end of a flattened cam section 76 of cam 74.

In its lower end position 38, the actuating pin 31 rests on the lower prong of the fork of guide means 72, the lid 60 being positioned in a vertical uncovering position 62 pivoted by about 100 degrees from its previous position and the hold-down element 75 contacting the periphery of cam 74.

The device operates as follows:

Initially, the device 1 is equipped with containers 2 filled with liquid to be analyzed outside the analyzer. For this purpose, the cover means 6 is manually pivoted by actuating retainer 70 by means of its arm 71 and moving it together with lid 60 from its horizontal covering position 61 to its vertical uncovering position 62. Then the closure (not illustrated) of a container 2 is removed and the container placed in the receptacle 10 of device 1. Subsequently, retainer 70 is manually pivoted back to its covering position 61 so that the opening 20 of the container is covered by the lid (see Fig. 2).

This procedure is repeated until all receptacles 10 of device 1 are equipped with containers 2. In an input station (not illustrated) of the analyzer the device 1 is now placed on the horizontally extending transport path 5 and moved to a processing station 4 (shown in Figs. 1 and 2) by means of a microprocessor-controlled transport means (not illustrated). In this position, device 1 is aligned with a receptacle 10 in the area of the actuating means 3 or with a container 2 in the aspirating station 40 beneath the aspirating head 41 for liquids to be analyzed. Alignment is effected by means of sensor 14 arranged at the transport path 5 and the sensing marks 13 of device 1.

Then the actuating element 30 of the actuating means 3 is pulled down by means of the drive pin 35 of the microprocessor controlled, motor-driven eccentric drive 34. First, the lower sensing aperture 32 of the actuating element 30 is moved out of the sensing range of sensor 33. Then actuating pin 31 arranged at the upper end of the actuating element 30 hits the lower prong of guide means 72 of arm 71 and pivots retainer 70 together with lid 60 from its covering position 61 to its uncovering position 62. Actuating element 30 is moved downwards until it has reached the sensing range of sensor 33.

Then the aspirating head 41 is lowered into container 2 for removing liquid to be analyzed and, after an upward movement to its upper end position, moved to a further processing station (not illustrated).

Subsequently, eccentric drive 34 is started again and retainer 70 together with lid 60 is pivoted back to the covering position 61 by means of actuating element 30. Actuating pin 31 thereby hits first the upper prong of guide means 72 and pivots

retainer 70 from its approximately vertical uncovering position 62 to its approximately horizontal covering position 61 before it releases guide means 72.

In this position, cam 74 of retainer 70 has pivoted about the axis of rotation 63 to the extent that cam section 76 contacts hold-down element 75 and thus forms a lever arm which by means of the spring force of hold-down element 75 produces a torque that urges retainer 70 into its covering position 61 and presses lid 60 onto the opening 20 of container 2 such that evaporation, contamination or spilling of the liquid to be analyzed within and outside the analyzer is reliably prevented.

Claims

1. A device (1) comprising linearly arranged receptacles (10) to receive containers (2) filled with liquid to be analyzed and a cover means (6) equipped with sealing means (64) for covering the openings of the containers, characterized in that
 - each receptacle (10) includes a lid (60) associated with an opening (20) of a container (2), and in that
 - the lid (60) can be pivoted from a covering position (61) to an uncovering position (62).
 - Device according to claim 1, characterized in that lid (60) is movably arranged on a retainer (70), and in that the retainer can be pivoted about a horizontally extending axis of rotation (63).
 - Device according to claim 1, characterized in that lid (60) is retained in its covering position (61) by means of a hold-down element (75).
 - Device according to claims 2 and 3, characterized in that a cam (74) is mounted concentrically to the axis of rotation (63) on retainer (70), and in that hold-down element (75) engages with cam (74).
 - Device according to claim 1, characterized in that lid (60) is pivoted from its covering position (61) to its uncovering position (62) and back by an actuating means (3) if the device (1) is arranged within a processing station (4) of an analyzer.
 - Device according to claim 1, characterized in that lid (60) can be manually pivoted from its covering position (61) to its uncovering position (62) and back if the device (1) is arranged

outside the analyzer.

7. Device according to claims 2, 5 and 6, characterized in that an arm (71) is arranged on retainer (70) for manually or automatically pivoting lid (60). 5
8. Device according to claims 5 and 7, characterized in that the actuating means (3) comprises an actuating element (30) for arm (71). 10
9. Device according to claims 7 and 8, characterized in that guide means (72) are provided on arm (71). 15
10. Device according to claim 8, characterized in that the actuating means (3) comprises a microprocessor controlled, motor-driven eccentric drive (34) for the actuating element (30). 20
11. Device according to claims 8 and 10, characterized in that the actuating element (30) includes sensing means (32) associated with the covering position (61) and the uncovering position (62) and arranged in the area of a sensor (33). 25
12. Device according to claim 5, characterized in that each receptacle (10) is associated with a sensing mark (13). 30
13. Device according to claims 5 and 12, characterized in that in the area of the actuating means (3) a sensor (14) is arranged in an aspirating station (40) for liquid to be analyzed. 35
14. Device according to claim 1, characterized in that lid (60) consists of a resilient plastic material and is designed as a sealing means (64) on its bottom surface. 40

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FIG. 1

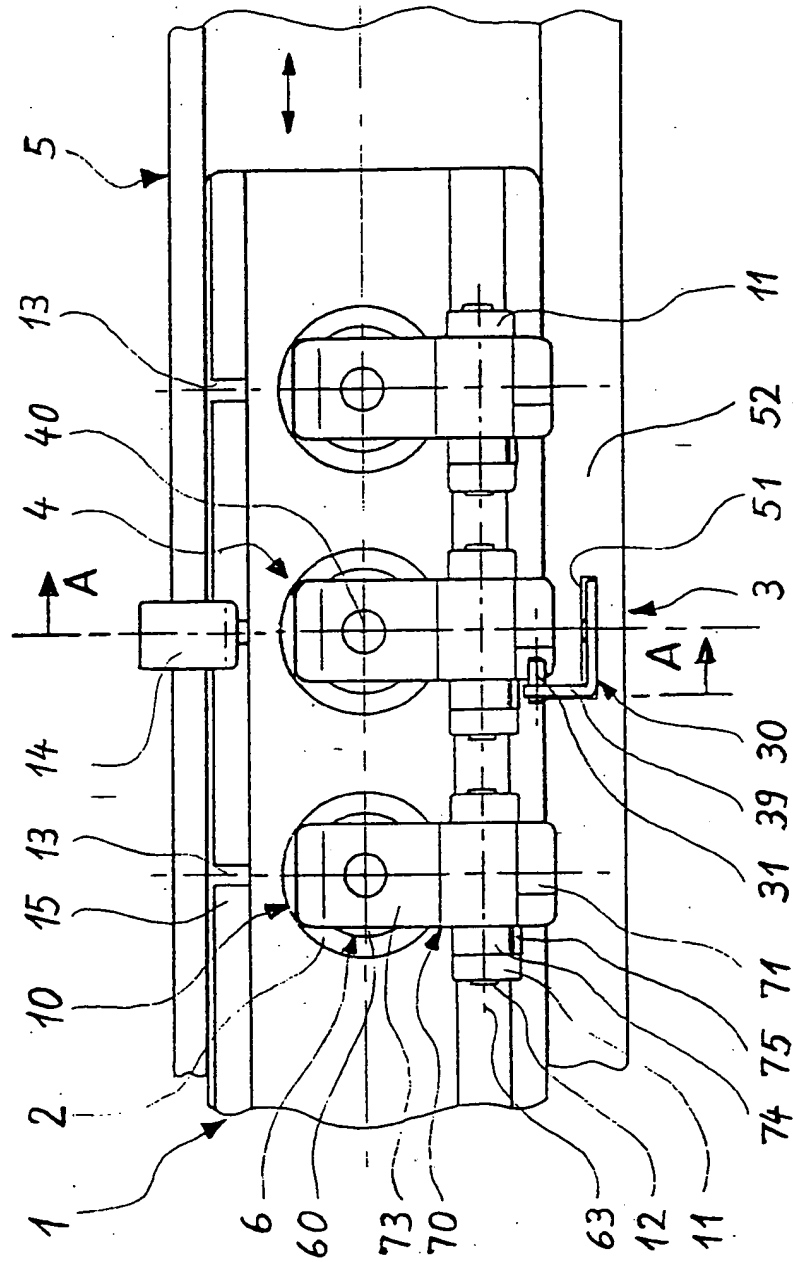
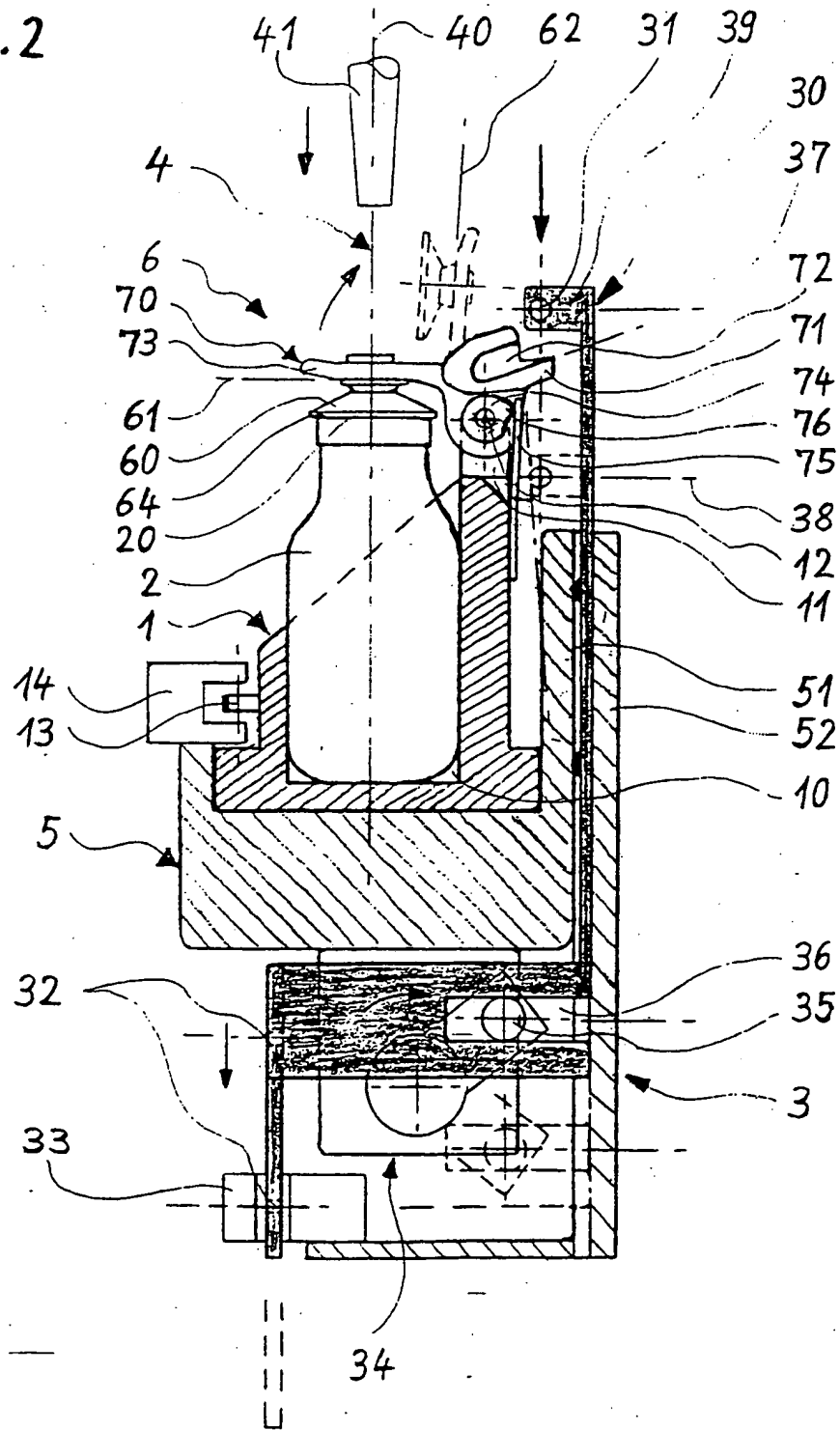


FIG. 2





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 92 11 0870

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL.5)
X	US-A-4 455 280 (T. SHINOHARA ET AL.) * the whole document *	1-8, 12-14	G01N35/06 G01N35/04 B01L9/00
X	DE-A-3 346 517 (OLYMPUS OPTICAL CO. LTD.) * figures 1-3 *	1-8,14	
A	EP-A-0 299 661 (FISHER SCIENTIFIC COMPANY) * column 5, line 2 - column 6, line 42; figures *	1,3-8, 11-13	
A	US-A-4 785 677 (Y. HIGO) * figures *	1,10	
A	DE-A-2 913 989 (M-J. SCHÖNHUBER)		
A	US-A-5 026 526 (J.A. QUENIN ET AL.)		
			TECHNICAL FIELDS SEARCHED (Int. CL.5)
			G01N B01L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 NOVEMBER 1992	Examiner HODSON C.M.
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